Synthesis of High Hydroxyl Functionalized Polyol from Soybean Oil Using Dicarboxylic Acid as Ring Opening Agent

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A new polyol intended for the application in polyurethane was synthesized by epoxy oxygen ring opening in epoxidized soybean oil (ESO) with malic acid (MA), a dicarboxylic acid used for food additives. A yield of around 91% was achieved by the epoxidation of soybean oil using H2SO4 as catalyst and an epoxy conversion rate of about 70% was achieved by the ring opening of ESO by malic acid. An average molecular weight of 940 g/mol for ESO and 1300 g/mol for ESO-MA was obtained from the mass spectrum analysis. The synthesized polyol had 5.6 hydroxyl groups, higher than those previously synthesized ESO polyols. The structures of polyols were further characterized by FTIR spectroscopy and 1H-NMR. In FTIR, new peaks were observed near 830 cm-1 for ESO and 3460 cm-1 for ESO-MA polyol indicating the formation of epoxy group and hydroxyl group in the polyol, respectively. In NMR, new peaks at around 2.8-3.2 ppm and 3.6-3.8 ppm were observed for ESO and ESO-MA polyol, respectively. Relation between viscosity and temperature was also studied for ESO and ESO-MA polyol. This synthesized polyol can have the potential application for synthesis of polyurethane.